TRANSACTIONS OF THE SOCIETY.

ANNUAL ADDRESS.

BY M. F. MAURY, L.L.D., LIEUT. U. S. N.

THE following Address was delivered by M. F. MAURY, L.L.D., Lieut. U. S. N., at the Annual Meeting of the American Geographical and Statistical Society, on Thursday Evening, Feb. 16th, 1854.

The return of the period for the Annual Address suggests a review, though brief, of the progress which has recently been made in the science which it is the especial object of the American Geographical Society to promote.

These annual addresses, and the impressions which they make in the history of societies serve, as we drift along down the stream of time, as landmarks, as points of departure, from which we may look back, and by looking back, judge the more wisely what tack to go upon, what new course to shape. The mariner watches the progress of his vessel from hour to hour upon the high seas. Although during the voyage, he constantly looks ahead to his port of destination, he does not forget occasionally to glance back to the haven whence he sailed, that seeing how far he has come, he may the better measure how far he has still to go. When the retrospect is satisfactory, it is also encouraging—for by cheering the spirit it helps one along. So too on occasions like the present, when the friends of human progress in this or in that department of knowledge meet

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together at stated periods, it is good to glance back as well as to look forward. The co-laborers and friends in the cause of the American Geographical and Statistical Society are now assembled for the purpose of hearing the annual address of the society.

If we now pass, though never so hastily, in review, the progress that has been made in geographical discovery and improvement during the last year, the members of this society too, like the master of the well managed ship upon the trackless ocean, will, I have no doubt, derive encouragement from the retrospect, and enter upon the labors of the new geographical year with stouter hearts and braver minds.

The geographical problem that for ages has baffled the world, has been solved during the past year.

Though no ship has as yet actually made the North-West passage, yet navigators coming from the West, and navigators coming from the East, have met together, and shaken hands across the ice; Lieut. Cresswell, of Her Majesty's Navy, entering the Arctic ocean through Behring's straits in the "Investigator," has sailed, and travelled, and sailed, until to him belongs the distinction of having been the first to put a girdle round about this great continent of the new world.

Commander McClure, of Her Majesty's ship "Investigator," doubled Cape Horn in the spring of 1850, on a voyage to the Arctic regions, in search of Sir John Franklin and his companions.

Entering Bhering's Straits, he parted company with Her Majesty's ship "Herald," Capt. Kellett, off Cape Lisburne, July 31, 1850, and was last seen six days afterward on that side, standing to the Northward and Eastward with studding sails set.

There Kellett left him to return to England.

The next time he was seen was on the 6th of April, 1853, in the Bay of Mercy, by Lieut. Pim, who was serving under Kellett.

Thus Kellett and his officers were the last to bid McClure "God speed" on the West, and to give him the helping hand of welcome on the East

To McClure belongs the high honor of putting to rest this vexed question of a Northwest passage. On the 26th day of October, 1850, being on a travelling party, he established the fact that the Strait between Baring Island and Prince Albert Land, which he calls Prince of Wales Strait, and in which his ship was, connects

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itself by water and ice, with Baffin's Bay, through Melville Sound, Barrow Strait, and Lancaster Sound.

This is the question that has vexed old England for centuries.

The problem of a short cut to "Cathay," of a passage to the East, is the most important geographical problem that has ever engaged the attention of enlightened, civilized societies. It was this problem that led to the discovery of the new world, and after this continent was discovered and portioned out among the Kings of the earth, a passage Westward to the Indies was still the grand problem. At this very moment the subject of a railway to the Pacific, of canals across the Isthmus, and their bearings upon that self-same land of Cathay, fill a large space in the public mind. So that we have not yet done with this interesting problem, though nearly four centuries have elapsed since it was first taken up.

If a *bona fide* Northwest passage, one that could be available at all times, and that would afford a passage to merchantmen, could really have been found, it would have placed England almost as near to China as she now is to the Isthmus of Panama. Accordingly, we find her, whenever, during the last 300 years, she has had a respite from war, pushing forward her expeditions for the discovery of this passage. Indeed, since the last European war, and during the long peace which has followed it, her efforts at a Northwest passage have been up to this hour almost incessant. All honor, therefore, to Captain McClure for having settled this question.

It is true the whales of the sea, in their mute way, had signified that there was a water communication from one side of this continent to the other, for we find the same kind of whale in Baffin's Bay that is found in Bhering's Straits, and know that the Torrid zone is to this animal as a sea of fire through which he cannot pass. The right whale of Bhering's Straits, it was proved, never could double Cape Horn or the Cape of Good Hope. In fact, he could not either cross over the Equator, or pass over into the Southern Hemisphere at all. Therefore, when the same whale that was found in Bhering's Straits was seen also in Baffin's Bay, the conclusion was almost irresistible that there was a Northwest passage and the whales knew of it.*

"Whales harpooned in the Greenland seas, have been frequently caught in the Pacific," and vice versa.

"A Dutch Captain, Jacob Cool of Sardam was informed by the Fischal Zee-

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The currents of the sea also had indicated that there was water communication from one side to the other.

And philosophers consulting the agents which control the winds, and studying the developments of nature, had gathered data from those regions, tending to prove the same thing. Yet, notwithstanding these probabilities, and this amount of circumstantial evidence, the question of an open sea in the Polar basin, has been left as a scientific question in the category of an unsolved problem.

McClure's track was for the most part along the coast, and, therefore, he could not throw much light upon the question of an open sea in the Arctic ocean.

But as for the Northwest Passage, money, time, and the lives of many gallant sailors had been offered up in the effort to find this communication. The problem was too important, the national mind of a self-relying and a proud people was too deeply interested, to admit, after such sacrifices, any other evidence as conclusive, short of that which appeals to the senses and comes within the category

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man of India, that a whale caught in the Sea of Tartary, had in his back, a Dutch harpoon marked, W. B., which harpoon was identified as belonging to William Bastiaanz, Admiral of the Dutch whaling fleet; the whale had been struck in the Spitzbergen Seas."

"In Müller's voyages it is related that the crew of a Russian discovery ship, while wintering on the west coast of Kamschatka, found on the beach the carcase of a whale, in which was a harpoon of European workmanship, marked with Roman letters."

"Hendrick Hamel in his *unfortunate voyage of the Yacht Sparwer*, corroborates Müller. He says that in the sea to the North East of Korea, they take every year a great number of whales, in some of which are found harpoons of the French and Dutch, who practise the fishery at the extremities of Europe; whence we infer (A. D. 1653) that there is surely a passage between Korea and Japan which communicates to the Strait of Weigatz, separating Nova Zembla from the continent of Europe."

"In 1813 a whale was killed by the ship Volunteer of Whitby, off Spitsbergen, in which was found part of a lance made of a hard grey *stone*, of a flinty appearance, about 3 inches long, 2 inches broad and $\frac{2}{10}$ of an inch thick; with two small holes, as if for the purpose of lashing the stock or shaft."

"In 1812, in the Spitzbergen seas, the Aurora of Hull took a whale having a harpoon of *bone* stuck in his back."

"The Esquimaux from their frequent intercourse with Europeans have long used iron implements; so that those of *stone* and *bone* must have belonged to some tribes on the unexplored Northern face of the American continent." *Scoresby's Arctic Regions.*

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of proof positive. All honor, therefore, to Commander McClure and his gallant crew, who have wrung from the iceberg and barrier, from privation and danger, this proof. I hope, and I am sure this society will heartily join me in the wish, that, at our next annual address, your orator will have the pleasure of calling him "Admiral McClure," for I consider he has performed a most important work.

The geographical fact that he has established, viz:—that there is no practicable way through the Northwest to the "Indies" is, next to the discovery of a practicable way, the most important discovery that it was possible to make in those regions. Call it a negative discovery, if you please; negative results are to him who is in search of truth, sometimes in the importance of their bearings, equal to and altogether as reliable, as positive.

Cui-bono?

Does any one ask the question? Why, the energies of Great Britain—of the most powerful nation that has ever yet culminated in its greatness, have been directed to a passage there. And they have been directed with an intensity and with an interest that have diverted the mind of a great people from other and perhaps more utilitarian enterprises. The money which that nation has expended from first to last in the search of that passage would, with its interest, nearly suffice now to connect the two oceans by a canal across the Isthmus. Her own officers have at last demonstrated that there is no practicable route to the North West. The attention, therefore, of that great nation and people will now, no doubt, be as earnestly directed to some practicable route, either by railway or canal across the continent, as it has been to an impracticable route.

The North West passage is a subject which has, from peculiar circumstances, occupied a large share of attention before this Society. Its Vice President has been munificent towards it. He has fitted out an expedition for search and discovery there, which has made his name respected and revered wherever true nobleness is admired or deeds of humanity cherished.

British officers and the British Admiralty have been charged, in the hearing of this Society, with wrong to this expedition.

The claims of Lieut. De Haven, it was alleged, have not only not been acknowledged in England, but the credit due for the discoveries of this expedition has been taken away from those on this

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side of the water, to whom honor is due, and given to those on that, who, rightfully, have neither part nor lot in the matter.

These charges were made by a member of this Society,* and not without show of reason; for I hold in my hand a chart published on the 14th of October, 1853, at the Hydrographic Office of the Admirality, entitled,

"CHART Showing the North West Passage, Discovered by H. M. "Ship Investigator; also the Coast Explored in Search of Sir "John Franklin, by Sir James Ross, 1848-49; Sir John Richard- "son, 1848-49; Capt. McClure, 1850; Capt. Austen, 1850; Mr. "Penny, 1850; Mr. Rae, 1851; Mr. Kennedy and M. Bellot, 1852; "Capt. Inglefield, 1852-53; Capt. Sir Edward Belcher, 1852-53.

"By E. A. Inglefield, Commander, H. M. Ship Phœnix,—Hydro- "graphic Office, Admirality, 14th October, 1853."

In this chart Lieut. De Haven and the Grinnell Expedition are ignored, and the discoveries made by them, given to Penny and Belcher.

The mere appearance of wrong from such a quarter, to an expedition fitted out under the circumstances which characterized the Grinnell Expedition, could not fail to attract the attention both of the government and people of the United States.†

It is a misfortune that matters of scientific concern should ever serve to excite international controversy, or whet popular jealousies and national animosities.

Men of science, as such, know no internationality. They owe allegiance to but one power, and that is TRUTH; and they are all fellow-citizens alike of the great Republic of Science.

That any British officer, from the highest Admiral down to the youngest mid-shipman could find it in his heart to do any one the slightest wrong in the matter of this Grinnell Expedition, I never could imagine.

I am, therefore, the more happy to announce to this Society, that last night a newly revised Admirality Chart was placed in my

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* See paper entitled "Grinnell Land" read before the National Institute, Washington, in May, 1852, by Col. Peter Force; also paper entitled, "Supplement to Grinnell Land," read before National Institute, July, 1853, by Col. Force.

† See remarks upon it made by the Secretary of the Navy in his last Annual Report to Congress.

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hands by a friend. It is entitled, "Discoveries in the Arctic Sea up to 1853," and has the stamp of the Hydrographic Office of Great Britain upon it.

Its actual date of publication is, I take it, subsequent to that of October, to which I have just alluded.

I have not had time to examine this new chart thoroughly; but as far as I have had an opportunity of looking over it, it gives me pleasure to say IT IS ALL RIGHT, with the single exception of the Grinnell Land and Mount Franklin of De Haven.

The Grinnell Land of De Haven has been on former Admiralty charts, called Prince Albert Land. On this chart, the name "Prince Albert Land" is omitted, but the name of Grinnell Land has not been restored.

I think it ought to be restored.

Mount Franklin was never reached by De Haven. It was simply seen bearing N. N. E. in the distance from the highest point in latitude reached by him. Whether it was 20 or 60 miles off, he knew not.

On this revised Admiralty chart, it is placed upon the shore of Wellington Channel, notwithstanding that Belcher reports as he went along up that channel, that he saw nothing of the Mount Franklin of De Haven on that shore.

But doubling around the peninsula which separates Wellington Channel from Jones' Sound, he traveled in a south-eastwardly direction, and ascended a mountain 1500 feet high on the opposite side of this peninsula.

This, I have no doubt, is the Mount Franklin of De Haven. It is in the direction that he gives it from the highest point of latitude reached by him; and as to its existence, he has said to me over and over again, "There can be no doubt, for it was as palpable before my eyes as your face now is. How far it was from me I cannot say, but far or near, upon that N. N. E. line it stands, and there it will be found by whomsoever it may be sought."

There is no evidence that there is any elevation deserving the name of 'Mount' on the Wellington side of this peninsula, where this chart places the Mount Franklin. But upon the true line of bearing described by De Haven, a Mount has been found. I think, therefore, that Belcher's "Elevation of 1500 feet" on this chart is

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what De Haven saw and named in honor of the lost navigator, and that it ought to be so called on all charts.

I have deemed it a duty to the science to which we render homage, to say thus much upon this subject. For I am sure all that is necessary to cause the Admiralty chart of October, 1853, to be entirely suppressed, and to cause what is right to be done touching the Grinnell Land and Mount Franklin on the more recent charts, is to invite in a truth-loving spirit, the attention of the Royal Geographical Society, or any other English authority, to the subject.

That Society, like the great body of the English nation, is composed of men who love right and hate wrong, and in whose sense of justice I have great reliance.

I congratulate the Society upon the activity that has been and is now displayed by our own government and fellow citizens in the various fields of geographical research. Kane of the Navy is now on a second expedition to the Arctic regions in search of Sir John Franklin, and of geographical lore. That expedition was, I may say, started here in this Society, and therefore, I need only remind you that our latest intelligence from it was 20th July, 1853, when it had safely arrived at Upernavik.

In 1850, Lieut. Wm. L. Herndon, United States Navy, was sent to explore the valley of the Amazon. He was directed to cross over the Andes from Lima, and reaching the head waters of that river, he was to follow it to the sea.

The object of this expedition was eminently practical and highly important. It was to ascertain the present resources and future capabilities for trade and commerce of that magnificent water-shed.

His Report has been published by order of Congress, and it will be found one of the most interesting, instructive and valuable documents of the day. He ran a line of soundings from the sources of the Amazon, among the mountains to its mouth under the line, and found it navigable for vessels of the largest class, from the sea to the base of the Andes, a distance of nearly 3,500 miles. This expedition, beside the notes of its leader, brought home a valuable collection consisting of specimens of the *flora* and the *fauna* and other matter, illustrative of the physical geography of that most interesting region of country. These have not been described for want of funds—$2,500. Surely the government will furnish this

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sum, for if this collection were worth sending for, it is certainly worth description.

There is a close relation between the fauna and the flora of every country. The animal kingdom is based upon the vegetable, and the flora, if you please, may be considered as the resultant of meteorological agencies—of heat and cold, of clouds and sunshine, of rain, dews, and the hygrometrical relations generally of the atmosphere. Now whatever is calculated to throw light upon these conditions, has a bearing upon your favorite science, for the fauna and the flora of a country constitute the most striking features in its physical geography.

The capacities of the country drained by the Amazon, to sustain population, are thought to be the greatest in the world, and with a population equalling that of Belgium to the square mile—that river basin includes an area that is large enough to sustain a population of *Six Hundred Millions.* Its seed time is perpetual, its harvests never end, and its capacity to sustain population, has been computed to be fourfold that of Belgium.

The winds and currents of the sea, are such as to place the Atlantic ports of the United States on the wayside of all nations, either going or coming from the mouth of the Amazon. Therefore there is no region of country beyond our own borders, the physical geography of which is more interesting to the people of the United States.

Commerce, or rather produce, the basis of commerce, may be regarded as one of the exponents of physical geography; for explain to me the physical geography of a country, and I will tell you of what productions it is capable. In this sense, therefore, all that relates to the physical geography of the Atlantic slopes of South America, is calculated to be peculiarly interesting to the American citizen, because it has in the future such powerful bearings upon the commerce of his country.

One of the most striking features about the Amazon is well described by a sailor boy that belonged to Herndon's expedition. It bears upon the geography of that country, because it is illustrative of its present condition, and therefore I may be excused for quoting it.

Richards is a young man, who, without the advantages of a liberal education, had been brought up on a farm in Virginia. He

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had shipped on board the U. S. frigate Raritan for a cruise in the Pacific. Leaving that ship he joined Herndon's party in Lima. He had seen the waves in their majesty, and the storm in its grandeur off Cape Horn. In his voyage to the Amazon, and across the Andes, he had visited the famous quicksilver mines of Huancavalica and had walked through its modern monolithic caves, whose pink-stained arches, groins and columns are of the richest and most beautiful cinnabar. He had seen the Lake of Indian myths—the classic Titicaca of the Incas—and crossed the river Desaguadero, running from it, and which the natives assured him, sometimes running back up stream, empties into it. He had crossed the Andes where the scenery was wildness itself.

Descending their Eastern slopes, he had been enabled at one view to comprehend the whole range of the vegetable gammut from the regions of eternal snow on the mountain peaks, to the luscious climes of everlasting Summer in the plains below. And in these plains he had seen the vegetable kingdom rioting in new forms and teeming with new fruits—a tree whose fruit is bread, standing to the native in place of a bakery; another, which, with its juice, performs to him the office of a cow; and another, whose nuts stand him in the stead of candles; and another that grew and flourished in spite of the "Maine Liquor Law," for it was itself a natural distillery. These were things, and objects, and scenes, well calculated to make powerful impressions upon a mind like Richards', and wondering which of them had made the strongest, I said, "pray, Mr. Richards, what of all that you have seen during this most interesting expedition struck you as being the most strange?" "What struck me as the most strange and wonderful?" "Yes." "Why, that such a country, as is the valley of the Amazon, should in the middle of the 19th century, be a wilderness."

To the glory of the Republic, be it said, no moves by the State are hailed with more enthusiasm by the popular voice than those which have for their object the opening up by the lights of science and the arts of peace, of new fields to commercial enterprise or the extending of those already opened. It is to be hoped that we may soon see properly equipped expeditions steaming up the Amazon, and its magnificent tributaries, for exploration and discovery; for Herndon was necessarily so restricted as to equipment,

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that he could do but little more than one can who should undertake to drift down that river on a log.

Some of the strongest contrasts in geography are perhaps to be found in the region of country drained by this mighty river. The late General Illingworth, an Englishman, and a soldier of great worth, who joined the patriot cause of South America at its dawn, and who died but a few months ago, holding the office of Secretary of State in the Republic of Ecuador, mentions in a letter written not long before his death, one of those mountain, plain, sea and river contrasts, the like of which is, perhaps, nowhere else to be seen. In speaking of the Amazonian tributaries of Ecuador, he says:

"I cannot, however, but repeat here that a singular topographical phenomenon presents itself in the Ecuadorean section of the Andes. At the back, or to the eastward of Ambato, some unknown convulsion of nature has broken the chain of the Cordilleras, and opened a vast gap or chasm from West to East, where the deep stream of the Pastaza is formed, receiving the waters of the peopled districts of Riobamba, Ambato and Latacunga. It may be supposed, therefore, that a person on an elevated point near Ambato, and with a favorable atmosphere, might see the Pacific ocean and the course of the tributary Pastaza, descending through the Amazon to the Atlantic ocean. In the month of September, 1821, and on an elevation a few leagues to the westward of Ambato, I had the pleasure of viewing the above mentioned gap in the Andes, and on facing to the westward, I beheld for a full quarter of an hour the line of our coast, the Island of Puna, and the dark-blue shade of the Pacific ocean. The sun was setting and the evening clear."

There, with the waters of a navigable river, at his feet, coursing down to the Atlantic on one hand, he saw on the other, the island of Puna in the gulf of Guayaquil, the great South Sea, and the Pacific shores of his own litttle Republic.

Lieut. Page, in the U. S. steamer Water Witch, with a complement of most excellent officers, is engaged in an exploration of the Rio de La Plata and its tributaries. This river is the Mississippi of the Southern Hemisphere. Lieut. Page is well supplied with instruments and means. He has with him a photographic apparatus, with all the appliances which ingenuity has lent to modern

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geographical research. He and his officers know what to do with them. They love work and rejoice in their mission. I expect, therefore, when his survey is done, that we shall know much about the basin of that river, its commercial resources, active and dormant, its present capabilities and future capacities—in short, that the geography, in its widest sense, of that great hydrographic basin, will be then quite as well understood as that of our own Missouri.

My last letter from him is dated October 1st, 1853. He was then with his steamer at the City of Ascencion, on the Paraguay river. He had not found a single bar, sand bank or sawyer, to interrupt his progress. On the contrary, he carried twenty feet of water up to the city, which is farther from the mouth of the Rio de La Plata than St. Louis is from the mouth of the Mississippi.

Lieut Gilliss, U. S. N., is preparing for publication his labors as the Director of the Astronomical expedition to Chili. He is an officer of the most untiring industry, and we may expect from him valuable contributions to our knowledge touching the geography and statistics of that interesting country.

Lieut. McRae, one of his associates, who returned to the United States by crossing the Pampas of Buenos Ayres, has gone back to make further investigations. He too, will in due time, be ready with his mite to cast it into the common geographical treasury of the world.

Lieut. Chas. H. Davis is diligently at work with the second number of the American Nautical Almanac. That work so creditable to its conductor, so honorable to the country, so beneficial to its commercial and navigating interests, will be mighty in the cause of geographical science. That other great geographical problem, which has engaged the attention of the world as long as the Northwest Passage—and has been a day dream with the men of England, has not escaped the attention of government in these stirring geographical times.

The project of a ship canal across the Isthmus of Darien, has been renewed, and it is about to be presented to the world, under more favorable auspices than it has ever yet been. Lieut. Strain, U. S. N., sailed last December, with an excellent corps of young officers in the U. S. steamer Cyane, for the purpose of examining that route thoroughly. There is, therefore, in store among the

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labors of that party, another valuable contribution to the general stock of human knowledge.

Anchoring in Calidonia Bay, on this side, he will, from that beautiful sheet of water, enter the valley of the river Calidonia, which discharges there, and tracing this water shed to the "divide" between the two oceans, he will cross over and descend through the valley of the Savannah river to the Bay of San Miguel—another fine harbor through which the waters of this river reach the great South Sea.

America has done but little for the geography in one sense, of the "grand ocean," as some of the early navigators called the Pacific, since Lieut. Wilkes was there about fifteen years ago. But fresh instalments to the geographical treasury of the world, are already on their way home from those regions, and a new expedition is on its way out for more.

Commodore Perry, with his accustomed energy, has already had surveys made of several important places in the East, among them, the harbor of Jeddo, which is described by his officers as one of the boldest, and most beautiful sheets of water in the world, not excepting the harbor of San Francisco, or of Naples, or of Rio, nor your own lovely bay. "We ascended," says Lieutenant Bent, of the Mississippi, in a private letter, "to within about seven miles (in a straight line) of Jeddo, carrying from 40 to 17 fathoms water all the way. This was nineteen miles nearer the capital than any foreign vessel had ever previously been. This occurred after the reception, (of which I will speak presently;) and as everything had gone on very successfully, the Commodore did not wish to do anything that would militate against the advantages we had obtained, or he would have gone, I imagine, in sight of the city, which was hidden from us only by a point of land some three miles ahead.

"This is the finest sheet of water in the world, not excepting Rio and San Francisco. Thirty-five by twenty-five miles in diameter, surrounded by numerous snug coves and most lovely shores, it contains not a single island except close along its borders, and seems perfectly clear from obstructions of any kind to navigation. It connects with the ocean by a strait, ranging from ten to fifteen miles in width and forty fathoms in depth." He is constructing a chart of that harbor.

Ringgold with his squadron has, just about this time, entered

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fairly upon the field of his operations, which includes the North Pacific Ocean, with its arms, straits and gulfs. That is the largest surveying squadron now afloat under any flag. And never has any nation sent forth an expedition in the cause of science better fitted and found than that is. For accurate work and practical results it has with it all the means and appliances that government in the indulgence of an enlightened liberality could suggest, or that science, ingenuity and the improvements of the age could bestow. His squadron consists of five vessels. He is assisted by a corps of young and accomplished officers who have entered upon this service with him *con amore*.

These constitute the element of success. We may expect, therefore, in the course of the next three years much valuable information concerning the North Pacific Ocean, for discoveries and results as fast as made and obtained are to be sent home to the Hydrographical Bureau of the Navy for publication.

Thus we have, or will have, to enrich our archives, De Haven and Kane in the frozen sea; Strain and Herndon with Gibbon his companion, in the Torrid Zone; Perry and Ringgold in the East, with Page and Gilliss and McRae in the West.

Nor should I forget the line of deep sea soundings, especially, which was run last summer by Lieut. Berryman, commanding U. S. brig Dolphin, from the neighborhood of Newfoundland to that of Ireland. That line has important and practical bearings upon the question of a submarine telegraph between Europe and America. There is bottom for it.

From Newfoundland to Ireland the distance between the nearest points is about 1,600 miles, and the bottom of the sea between the two places is a plateau which seems to have been placed there especially for the purpose of holding the wires of a submarine telegraph, and of keeping them out of harm's way. It is neither too deep, nor too shallow. Yet it is so deep that the wires being once landed will remain forever beyond the reach of vessels, anchors, icebergs, and drifts of any kind; and so shallow that the wires may be readily lodged upon the bottom.

The depth of this plateau is quite regular, gradually increasing from the shores of Newfoundland to the depth of from 1,500 to 2,000 fathoms as you approach the other side.

The distance between Ireland and Cape Charles or Cape St.

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Louis in Labrador, is somewhat less than the distance from any part of Ireland to the nearest point in Newfoundland.

I do not pretend to consider the question as to the possibility of finding a time calm enough, the sea smooth enough, a wire long enough to carry and lay a coil of wire 1,600 miles in length; though I have no fears but that the enterprise and ingenuity of the age, whenever called on with these problems, will be ready with a satisfactory and practical solution of them. I simply address myself at this time to the question, in so far as the bottom of the sea is concerned; and as far that the greatest practical difficulty will, I apprehend, be found after reaching soundings at either end of the line, and not in the deep sea.

A wire, laid across from either of the above named places on this side, would pass to the north of the Grand Banks, and rest on that beautiful plateau to which I have alluded, and where the water of the sea appears to be as quiet, and as completely at rest as it is at the bottom of a mill-pond.

It is proper that the reasons should be stated for the inference that there are no perceptible currents, and no abrading agents at work at the bottom of the sea upon this telegraphic plateau.

I derive this inference from the study of a physical fact, which I little dreamed when I sought it, had any such bearings.

It is unnecessary to allude here to the rich germs which physical facts, apparently the most striking, are often found to contain. That great achievement which has harnessed the lightning and made one of the imponderable agents of the universe a messenger for man, has its root in the little physical fact that was first observed by a philosopher with regard to the legs of a dead frog.

So too with regard to these deep sea soundings, and the carefully labeled specimens from the bottom. When asked, as I have often been, for the *cui bono* touching that last, I have found myself under the necessity of answering the question, by asking, with Franklin, "what is the use of the newborn babe?"

Berryman brought up, with Brooke's deep sea sounding apparatus, specimens of the bottom from this plateau.

I sent them to Prof. Bailey, of West Point, for examination under his microscope. This he kindly gave them, and that eminent microscopist was quite as much surprised to find, as I was to learn, that *all* these specimens of deep sea soundings are filled with

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microscopic shells. "*Not a particle of sand or gravel exists in them.*"

These little shells, therefore, suggest the fact that there are no currents at the bottom of the sea whence they came; that Brooke's lead found them where they were deposited in their burial place, after having lived and died on the surface, and by gradually sinking were lodged on the bottom.

Had there been currents at the bottom, there would have swept and abraded, and mingled up with these microscopic remains, the debris of the bottom of the sea, such as ooze, sand gravel, and other matter. But not a particle of sand or gravel was found among them. Hence the inference, that those depths of the sea were not disturbed, either by waves or currents.

Consequently a telegraphic wire, once lodged there, there it would remain as completely beyond the reach of accident as it would if buried in air-tight cases.

Therefore, so far as the bottom of the deep sea between Newfoundland, or the Northern Cape at the mouth of the St. Lawrence, and Ireland is concerned, the practicability of a submarine telegraph across the Atlantic is proved.

But while the Navy has been thus occupied in winning laurels as green—may I not say as *green*, because they are won in times of peace and in the cause of knowledge and of truth, in the advancement of science and in aid of that progress which is upward and onward—may I not, therefore, say as GREEN as any with which it is possible for the hand of grim-visaged war to deck the brows of victors in his battles of heroes in his cause?

But while the Navy has been thus busied abroad, the Army and other branches of the public service have not been idle at home: The Coast Survey is a long established institution. A report of its proceedings is annually made to Congress. Gentlemen are familiar with the value of its labors, and therefore it is only necessary in this connection to refer to it as an establishment that has done and is doing much for those departments of knowledge which it is the especial object of this society to cultivate.

In the same category comes the Hydrographic Survey, by the Army, of the great American Lakes. That work, too, is being pushed forward even with more than its wonted vigor. It has already enriched one department of geography with an important

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discovery. You know it has been said that the bottom of Lake Huron especially, was far below the level of the sea: Capt. Macomb informs me that nowhere in that lake has he been able to find water more than 420 feet deep, which places the bottom of that lake far above the surface of the sea.

The Mexican Boundary Commission is busily engaged in bringing up its results.

Besides these there are various parties at work exploring routes across the wilderness for the great Pacific Railway. Lieutenant Williamson is on the Pacific slope running his lines with the spirit level and the theodolite. Gov. Stevens is at the North, Lieut. Whipple is at the South; and Gunnison—alas poor Gunnison! was in the middle.

Science has its achievements and peace its triumphs, yet how much does it not sometimes cost to win them? Lieut. Bellot, of the French Navy, upon the ice of the Polar basin, Lieut. Gunnison, of the American army, upon the great "divide" which separates the waters of the Atlantic from the waters of the Pacific, have each fallen victims to the cause of that science whose achievements we celebrate. Though far apart they were fellow-laborers in the same cause. They both were in search of a commercial route to Cathay.

Two more gallant spirits, two men more richly endowed with the accomplishments of officers, and the qualities of gentlemen, never fell before the ruthless hand of the savage, or the remorseless billows of the sea. The English have resolved to erect at Greenwich a monument to Bellot. Shall we be less mindful of our own than they are of strangers? No. Let us resolve, when this railroad is finished, to erect in the middle of it, and on some towering mountain peak, a monument to that gallant young soldier. Place it on the summit of the highest hill top, where it may catch the first rays of the morning sun as he rises from the Atlantic, and where his parting beams as he sinks to rest in the Pacific, may linger longest.

Nor should I omit to mention among the valuable labors of the officers of the army, the very successful and interesting exploration of the Zuni river by Captain Sitgreaves, U. S. Army, and his party. Much of the ground that this officer travelled over is new.

Besides these, Fremont and Beale, have also been striving with

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the Indians, and struggling with the snows of that great "divide," the latter with that daring and gallantry which has challenged our admiration on former occasions, the former with a degree of zeal and energy that has seldom been equalled, never surpassed.

We owe to him much of our geographical information concerning that region of the country, and he has made contributions which have been acknowledged and appreciated wherever geography is cultivated as a science. An enthusiastic amateur, that brave explorer is now there at his own risk and expense for the purpose of solving certain questions which in his former expeditions he was unable to resolve.

From this hasty review of what has been recently done and of what is doing for geography by the government and the people of the United States, it appears that few countries have ever at any time been able to boast of more activity in this department of scientific research and discovery. And which of these expeditions has not the public mind followed with interest and pleasure and profit? To the honor of our free institutions and of a free people, be it said, not one. The popular will is in favor of them all.

But though much has been done, these researches and these expeditions have, as they have made their advances, served to extend the horizon, have given us new lights, and show us that much yet remains to be done. Prominent among the *agenda* of this society during the coming year, is to foster by its influence and its counsels another expedition up the Amazon like Page's in the La Plata. The Amazon is at our own doors and we begin with it. I shall only allude to one other which cannot fail to commend itself to the good offices and favorable consideration of this Society, and that is the exploration of the valley of the Amour in Mantchouria. This river I believe belongs to Russia, though its navigation was ceded to China by Peter the Great in 1689. That was before modern science and enterprise could have been brought to bear upon it; consequently, unless a party be sent to explore it from some of the states of Christendom, it will continue to rest in its present darkness for other centuries.

"In almost every point of view," says Findlay, in his directory for the Pacific Ocean, published in 1851, "the Amour is the most valuable stream in Northern Asia. Of all the large rivers of that boundless region it is the only one that empties itself into a navi-

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gable part of the universal ocean. It is, in fact, the only highway of nature that directly connects the central steppes of Asia with the rest of the world. But the political arrangements of man have decreed otherwise; and at this moment the Amour is infinitely less useful as a channel of traffic than almost any one of the land-locked rivers of Siberia. The navigation of the Amour was given, it is understood, for the privilege of holding a fair at Kiakhta, or establishing a factory at Pekin, which, according to Sir George Simpson, has turned out a poor compensation for the loss of this valuable artery to Central Asia; and by which cession the Russian possessions of Kamschatka and the islands beyond are reduced to half their value.

The researches concerning the winds and the currents of the sea, which have been carried on at the Observatory, enable me to say that the climate of that river basin corresponds to that of our lake basin, including the valley drained by the St. Lawrence, the Hudson, and the rivers of the New England States generally. And what the commerce between these states and river basins with Europe is, such may be and, in time, will be the commerce between the Amour and the Pacific States of this Union. China is in a state of revolution, and one of the first things after the revolutionists get firmly seated in power, will be, no doubt, an attempt on the part of the United States to form a commercial treaty with that people upon more liberal principles. And that this treaty might be made with eyes open, how important is it that our diplomatists should have full and complete information as to that immense Amour country, as to the navigation and navigability of that river, and as to its present capabilities and future capacities for trade and commerce. It is to be hoped that the enlightened Statesman at the head of the Navy Department will, ere long, feel himself at liberty to organise such an expedition.

There has been set on foot during the last year another move by the United States, which, in the judgment of many, is calculated to have important and wholesome bearings upon the physical geography of the world. I allude to the Maritime Conference at Brussels, which was held by invitation of this government, and in which were represented, in the persons of twelve delegates, the principal maritime powers.

The labors of those twelve men as they sat in conference around

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the table at Brussels had, for their object, to convert every well appointed ship as she sails across the ocean, into a floating observatory, and to unite the whole sea-faring world into one general system of physical research. And thus an attempt, a well directed attempt, has been made to bring the sea regularly within the domains of philosophical research. But the atmosphere embraces the land as well as the sea. It is a whole, and as such, its agencies, its phenomena, and its laws ought to be studied. And why should not the same concert of action and uniformity of observation which Holland, and Denmark, and Spain, and Portugal, Sweden, Russia, Norway, Belgium, Prussia, England and the United States have agreed, at the recommendation of the Brussels Conference, to extend to the sea,—why should not the same uniformity and concert be extended also to the land?

It is now proposed to convoke in Brussels a general Meteorological Congress, which shall consist of one or more delegates from every Christian nation, and that it shall be the duty of this assemblage to devise a plan of meteorological research, which, including both sea and land, may become universal. Quetelet and Kreil, Hanstein, Kupffer, Buys Ballot, Airy, Secchi, Lamont, Sabine, James, and Jansen, and Beechey, with a host of others, have expressed themselves in favor of it.

But, for it to commend itself to the favorable consideration of this society and to its active supporters, it is only necessary to say that the proposition is one which promises many highly important and useful results. Nor does it call either upon the government or individuals for any heavy expenditure.

As a consequence of the discoveries to which the investigations made by the Navy, touching the phenomena of the sea have given rise, a new department of science has been added to the stores of human knowledge Perhaps the expression is too strong; therefore, I will say the corner stone for a new department of science has been laid, and I quote Humboldt for authority.

According to that great and wise man, a new branch of science has recently sprung up on this side of the water. It is styled Physical Geography of the Sea, and to the American Navy he ascribes the honor of originating it. As some of the first fruits of it, I have the pleasure of exhibiting to you two plates,* one show-

* Vide Plates XIV and XV, 6th Edition Maury's Sailing Directions.

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ing the shape of the basin which holds the waters of the Atlantic. This delineation is to the solid part of the earth's crust, which is under the water, what a map of the country is to its mountain ranges and other contrasts on the same solid crust above the sea level. The other is a vertical section from one side of the Atlantic to the other. These two delineations are the results of deep sea-soundings made by officers of the Navy.

These soundings were at first unsatisfactory, because the plan upon which they were conducted never contemplated bringing up the plummet; indeed to bring it up from great depths was considered impracticable; therefore there was an uncertainty about them; —there was a feeling in the public mind of vagueness with regard to their results. How do you know that the plummet has reached the bottom? Let us have specimens—was the cry.

In this stage of the undertaking, a clever young officer of the Navy—Passed Midshipman J. M. Brooke, who was at the time serving with me at the Observatory, came to my relief, and supplied by his ingenuity the very desideratum which was so much wanted. He arranged a deep-sea sounding apparatus, so that when the plummet struck the bottom, it would become detached from the line, leaving attached to the latter a small iron bolt, which would bring up specimens from the bottom.

Last Summer and Fall Lieut. Berryman, of the Dolphin, gave this apparatus a fair trial, and brought up with it specimens from the bottom at the depth of 12,000 feet. Samples of these specimens were sent to Professor Bailey, of West Point, for examination under his microscope. He kindly undertook the study of them, and as his letter, reporting the result, is short, perhaps you will permit me to read it:—

West Point, Nov. 29, 1853.

"My Dear Sir—I am greatly obliged to you for the deep soundings you sent me last week, and I have looked at them with great interest. They are exactly what I wanted to get hold of—the bottom of the ocean at the depth of more than two miles! I hardly hoped ever to have a chance of examining—yet, thanks to Brooke's contrivance, we have it clean and free from grease, so that it can at once be put under the microscope. I was greatly delighted to find that all these deep soundings are filled with microscopic shells; not a particle of sand or gravel exists in them. They are chiefly

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made up of perfect little calcareous shells (Foraminifera,) and contain, also, a small number of siliceous shells (Diatomaceæ.)

It is not probable that these animals lived at the depths where these shells are found, but I rather think that they inhabit the waters near the surface; and when they die their shells settle to the bottom. With reference to this point, I shall be very glad to examine bottles of water from various depths which were brought home by the Dolphin, and any similar materials, either 'bottom' or water from other localities. I shall study them carefully. * * The results already obtained are of very great interest, and have many important bearings on geology and zoology. * *

I hope you will induce as many as possible to collect soundings with Brooke's lead in all parts of the world, so that we can map out the animalculæ as you have the whales. Get your whalers also to collect mud from pancake ice, &c., in the polar regions—this is always full of interesting microscopic forms."

Truly, these results are suggestive: they seem to form but a slender clue, indeed—do these little mites of shells, by which the chambers of the deep are to be threaded and mysteries of the ocean revealed; yet in right hands and to right minds, they are sure guides to both light and knowledge.

The first noticeable thing the microscope gives of these specimens is, that all of them are of the animal, not one of the mineral kingdom.

The ocean teems with life, we know. Of the four elements of the old philosophers—fire, earth, air and water, perhaps the sea most of all abounds with living creatures.

The space occupied on the surface of our planet, by the different families of animals, and their remains, is inversely as the size of the individual.

The smaller the animal the greater the space occupied by his remains. Though not invariably the case, yet this rule, to a certain extent, is true, and will, therefore answer our present purposes, which are simply those of illustration.

Take the elephant and his remains, or a microscopic animal and his, and compare them. The contrast, as to space occupied, is as striking as that of the coral reef or island with the dimensions of the whale. The graveyard that would hold the corallines is larger than the graveyard that would hold the elephants.

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As Professor Bailey remarks, the animalculæ, whose remains Brooke's lead has brought up from the bottom of the deep sea, probably did not live or die there. They would have had no light there, and their frail little textures would have been subjected in their growth to a pressure upon them of a column of water 12,000 feet high, equal to the weight of 400 atmospheres. They probably lived and died near the surface, where they could feel the genial influences of both light and heat, and were buried in the lichen caves below, after death.

Brooke's lead and the microscope, therefore, it would seem, are about to teach us to regard the ocean in a new light. Its bosom, which teems with animal life, its face upon which time writes no wrinkles, makes no impression, are, it would now seem, obedient to the great law of change as is any department whatever, either of the animal or the vegetable kingdom. It is now suggested that, henceforward, we should view the surface of the sea as a nursery, teeming with nascent organism; its depths, as the cemetery for families of living creatures that outnumber the sands on the sea-shore for multitude.

Where there is a nursery, hard by there will be found also a graveyard—such is the condition of the animal world. But it never occurred to us before, to consider the surface of the sea one wide nursery, its every ripple as a cradle, and its bottom as one vast burial place.

On those parts of the solid portions of the earth's crust which are at the bottom of the atmosphere, various agents are at work, levelling both upward and downward. Heat and cold, rain and sunshine, the winds and the streams, all assisted by the forces of gravitation, are unceasingly washing away the high places; and as perpetually filling up the low.

But in contemplating the levelling agencies that are at work upon the solid portions of the crust of our planet which are at the bottom of the sea, we had come, almost, to the conclusion that these levelling agents are powerless there.

In the deep sea there are no abrading processes at work; neither frosts nor rains are felt there; and the force of gravitation is so paralyzed down there, that it cannot use half its power, as on the dry land, in tearing the overhanging rock from the precipice and casting it down in the valley below.

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When, therefore, I was treating of the basin of the Atlantic on another occasion, the imagination was disposed to regard the waters of the sea as a vast cushion placed between the air and the bottom of the ocean to protect and defend it from these abrading agencies of the atmosphere.

The geological clock may, thought I, strike new periods; its hands may point to era after era; but so long as the ocean remains in its basin, so long as its bottom is covered with blue water, so long must the deep furrows and strong contrasts in the solid crust below, stand out ruggedly and boldly rugged. Nothing can fill up the hollows there; no agent now at work, that we know of, can descend into its depths and level off the floors of the sea.

But it now seems that we forget these oceans of animalculæ, that make the sea sparkle and glow with life. They are secreting from its surface solid matter for the very purpose of filling up those cavities below.

Those little marine insects are building their habitations at the surface, and when they die, their remains, in vast multitudes sink down, and settle upon the bottom. They are the atoms out of which mountains are formed—plains spread out Our marl beds, the clay in our river bottoms, large portions of many of the great basins of the earth, are composed of the remains of just such little creatures as these, which the ingenuity of Brooke, and the industry of Berryman, have enabled us to fish up from the depth of more than two miles below the sea level.

These foraminifera, therefore, when living, may have been preparing the ingredients for the fruitful soil of a land that some earthquake or upheaval, in ages far away in the future may be sent to cast up from the bottom of the sea.

The study of these "sunless treasures," recovered with so much ingenuity from the rich bottom of the sea, suggests new views concerning the physical economy of the ocean.

I have endeavored to show how sea-shells and marine insects may, by reason of the offices which they perform, be regarded as compensations in that exquisite system of physical machinery by which the harmonies of nature are preserved.

The treasures of the lead, and revelations of the microscope, present the insects of the sea in a new light. We behold them now, serving not only as compensations by which the motions of

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the water in its channels of circulation are regulated, but also acting as checks and balances, by which the equipoise between the solid and the fluid matter of the earth is preserved.

Should it be established that these microscopic creatures live at the surface, and are only buried at the bottom of the sea, we may then view them as conservators of the ocean; for, in the offices which they perform, they assist to preserve its status by maintaining the purity of its waters.

It is admitted that the salts of the sea come from the land, and that they consist of the soluble matter which the rains wash out from the fields, and which the rivers bring down to the sea.

The waters of the Mississippi and the Amazon, with all the streams and rivers of the world, both great and small, hold in solution large quantities of lime, soda, iron and other matter. They discharge annually into the sea an amount of this soluble matter, which, if precipitated and collected into one mass, would no doubt surprise and astonish the boldest speculator with its magnitude.

This soluble matter cannot be evaporated. Once in the ocean, there it must remain; and as the rivers are continually pouring in fresh supplies, the sea, it has been argued, must continue to become more and more salt.

Now the rivers convey to the sea this solid matter mixed with fresh water, which, being lighter than that of the ocean, remains for a considerable time at or near the surface. Here, the microscopic organisms of the deep sea lead are continually at work, secreting this same lime, and soda, &c., and extracting from the sea water all this solid matter as fast as the rivers bring it down and empty into the sea.

Thus, we haul up from the deep sea, specimens of dead animals, and recognize in them the remains of creatures, which, though invisible to the naked eye, have nevertheless assigned to them a most important office in the physical economy of the universe, viz: that of regulating the saltness of the sea.

This suggests many contemplations. Among them, one in which the ocean is presented as a vast chemical bath, in which the solid parts of the earth are washed, filtered, and precipitated again on solid matter, but in a new form, and with fresh properties.

Doubtless, it is only a readaptation, though it may be in an improved form, of old, and perhaps effete matter, to the uses and well-being of man.

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These are speculations merely; they may be fancies without foundations, but idle they are not, I am sure; for when we come to consider the agents by which the physical economy of this, our earth, is regulated, by which this or that result is brought about and accomplished in this beautiful system of terrestrial arrangements—we are utterly amazed at the offices which have been performed, the work which has been done by the animalculæ.

But whence come the little calcareous shells, which Brooke's lead has brought up in proof of its sounding, from the depth of two miles and a quarter? Did they live in the surface waters immediately above? or in their *habitat* in some remote part of the sea, whence at their death, the currents were sent forth as pall bearers, with the command to deposit their remains where the plummet found them?

In this view, these little organisms become doubly interesting. When dead the descent of the shell to its final resting place would not it may be supposed, be very rapid. It would partake of the motion of the sea-water in which it lived and died, and probably be carried along with it in its channels of circulation for many a long mile.

The microscope, under the eye of Ehrenberg, has enabled us to put tallies on the wings of the wind, to learn of them somewhat concerning "its circuits."

Now, may not these shells which were so fine and impalpable that the officers of the Dolphin took them to be a mass of unctious clay—may not, I say, these, with other specimens of soundings yet to be collected, be all converted by the microscope into tallies for the waters of the different parts of the sea, by which the channels, through which the circulation of the ocean is carried on, are to be revealed?

Suppose that the dwelling places of the little shells which compose this specimen from that part of the ocean be ascertained, by referring to living types, to be the Gulf of Mexico—and of that from this part of the ocean, the regions about Cape Horn—of another, the Arctic Ocean, &c. The *habitat* and burial place, in every instance, we will suppose, are far removed from each other. By what agency, except through that of currents, can we suppose them to come from the place of their birth, and to be transported to that of their burial?

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It is in vain to attempt to answer the *cui bono* in all the bearings of facts like these. Suffice it to say they are physical facts; and in them, therefore, there is knowledge. They are facts which concern our planet, and touch the well-being or the rightly knowing of its inhabitants; and, therefore, renewed attention to this subject of deep sea soundings and the specimens of the bottom that may be brought up, cannot fail to be regarded with increasing interest.

There is something peculiarly attractive and interesting about the mysteries of the sea. There is a longing desire to know more of them.

Man can never see, he can only touch the bottom of the deep sea, and then only with the plummet. Whatever it brings up thence, is to the philosopher, matter of powerful interest; for by such information alone as he may gather from a most careful examination of such matter, the amount of human knowledge concerning nearly all that portion of our planet which is covered by the sea, must depend.

Every specimen of bottom from the deep sea is therefore to be regarded as a valuable contribution to the sources of human knowledge. And it is, in the judgment of right-minded men, a glorious privilege to have an opportunity of increasing the stock of human knowledge.

As it regards the subject before us, the officers of the American Navy are peculiarly favored.

They especially have the means and implements for sounding the ocean in its greatest depths, for collecting specimens from its bottom, as well as from its surface, and for trying its currents and its temperatures both at and below the surface.

The means of doing this are not only placed at their disposal by an enlightened government, but it is by that government made their duty, as I am sure it will be their pleasure, to use them.

I hope soon to have this interesting department of the physical geography of the sea enriched, not only by specimens of bottom and soundings, but with various other materials and data collected by our ships afloat in the Indian and Pacific oceans, the China seas, and elsewhere.

I cannot find terms too strong to express my ideas as to the sublime spectacle which the world is about to afford, touching this united effort to investigate the laws which control the winds and currents of the sea.

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The observations that are to be made for this purpose, are to be placed beyond the casualties of war. When Capt. Cook was on his celebrated voyage of discovery, war broke out between France and England, and the French Government was asked, for the sake of his mission, not to molest him.

The reply of the French King was, "I war not against science"; and orders were given to officers of the French Navy that if any of them should fall in with Capt. Cook, to recollect that he was the enemy of no man, but the friend of the human family; and they were commanded to treat him as such.

The Brussels Conference has recommended a like immunity for the observations that are to be made under this general system of cooperation, of vessels of all nations at sea, and the government of the United States has endorsed it.

By such a corps of observers, for in addition to our own, the marine, both commercial and naval, of Holland, Prussia, Denmark, and Sweden, of Belgium, Bremen, Hamburg, Russia, Portugal and Spain, of Chili, Brazil, and Great Britain, are enlisted, and are actually at work.

By the labors of such multitudes all catechizing nature to the same point, and questioning the winds and the waves for their secrets, we may expect many an answer that will have a bearing for man's good, as to which we little dream.

I may be pardoned for illustrating this position by an incident of recent occurrence.

The national heart is yet grieving for the terrible calamity and dreadful loss of life which has recently occurred on board the steamer San Francisco, as she was bound hence to California, with seven or eight hundred souls on board.

She was reported to have been seen on the 25th and 26th of December, in a completely disabled condition. There was anxiety in the public mind, and a desire and readiness to send relief to those gallant men. But which way or where to send vessels and relief, who could tell?

I was called on. After consulting that chart* on the wall, on which the temperature of the surface water of the ocean is shown for each month, I was surprised to find that the limits of the Gulf

* Maury's Wind and Current Charts—Thermal Chart, North Atlantic series.

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Stream for the month of January were what that chart shows them to be.

I discovered from this examination, that the San Francisco when seen on the 25th and 26th of December, instead of being on the southern edge of the Gulf Stream, as was generally supposed, and as the common charts of navigation would seem to indicate, was actually north of the middle.

The diagram there is taken from a chart, on which, for the information of the Navy department, I described the position of the Gulf Stream for January, and drew lines to show the direction in which the wreck had probably drifted, and the place where she would be most likely to be found.

Happily before any of the vessels sent in search of her had sailed, the Kilby, the Three Bells, and the Antarctic, had fallen in with, and relieved her. But this was not known at the time, and the instructions which, by request of the Secretary of the Treasury, I gave to the Revenue Cutter from New London, and which instructions were derived entirely from that chart, directed the vessel to pass so near the place where the San Francisco went down, that had the cutter been in time, she would have been in sight of the steamer when she went down.

There has been recently commenced at the Observatory, a chart which it may be worth while to mention, as it bears upon the subject before us. It is what may be called a topographical chart of the sea. The object of it is, by means of the materials which are afforded by the large corps of observers, who are co-operating with me in researches concerning the phenomena of the sea, to show those parts of the ocean where icebergs are seen, where snow falls, where water-spouts rise, where drift wood is found, where seaweed, flying-fish, &c., are seen.

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